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# **Solar Terrestrial Probes #5**

## **Interstellar Mapping and Acceleration Probe**

### **Pre-Proposal Conference**

# **Technical, Management, and Cost Overview**

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# Outline

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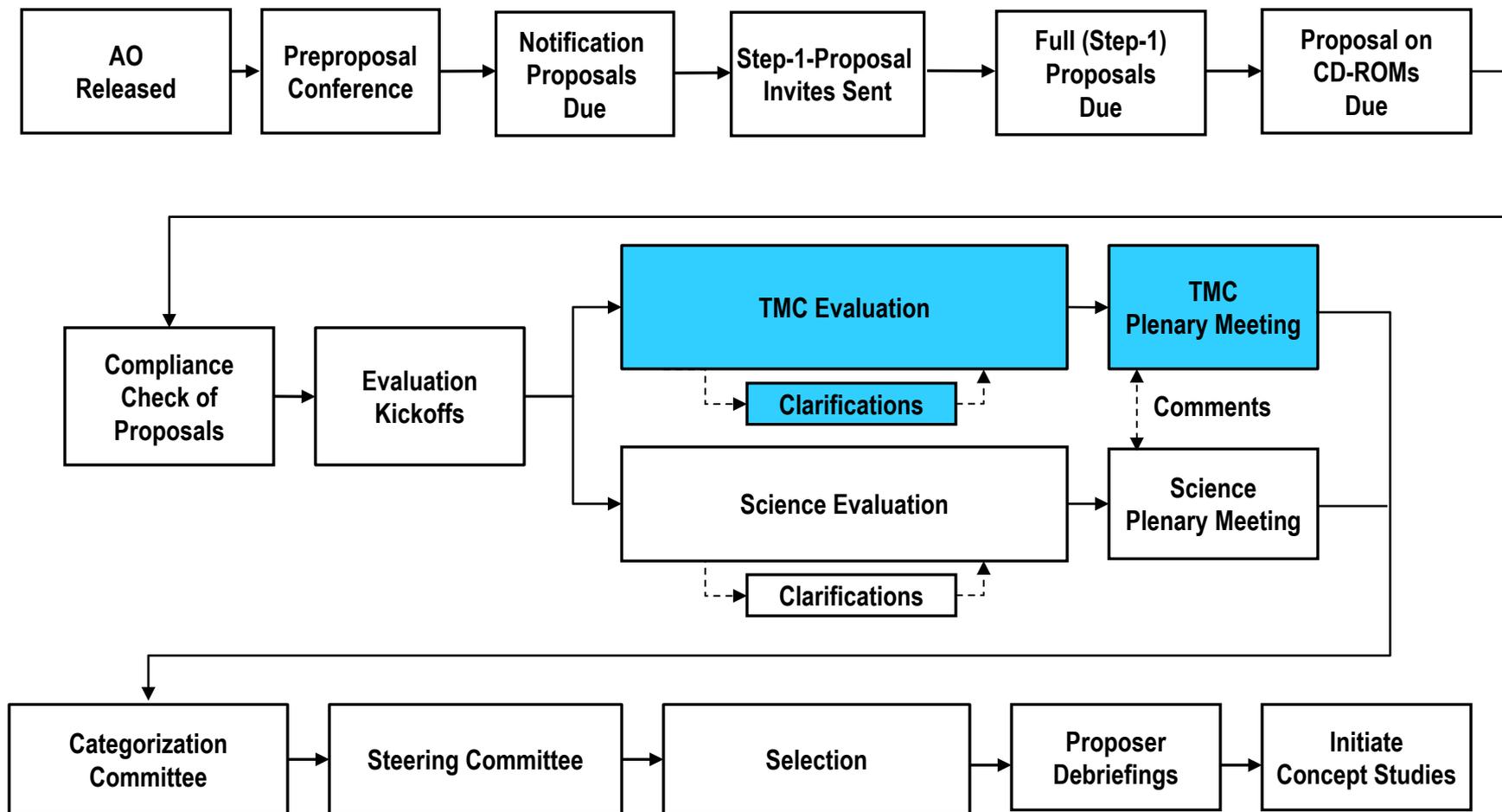
- **Technical, Management, and Cost (TMC) Evaluation**
- **IMAP AO Highlights**
- **References**
- **Questions**



# Technical, Management, and Cost (TMC) Evaluation



# Proposal Evaluation Flow





# TMC Panel Composition and Organization

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- The Acquisition Manager, who is a Civil Servant in the NASA Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC), leads the TMC panel.
  - NASA SOMA works directly for NASA Headquarters and is firewalled from the rest of NASA LaRC.
- TMC Evaluators are a mix of non-conflicted contractors, consultants, and Civil Servants who are experts in their respective fields.
  - Evaluators read their assigned proposals.
  - Evaluators provide findings on their assigned proposals.
  - Evaluators provide ratings of proposals that reflect findings.
- Additionally, Specialist Evaluators may be called upon in cases where technical expertise that is not represented on the panel is needed.
  - Specialist Evaluators evaluate only those parts of a proposal that are specific to their particular expertise.



# Evaluation Principles

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- All proposals are evaluated to uniform standards and without comparison to other proposals.
- The TMC evaluation assesses the likelihood that the submitted investigations' technical and management approaches can be successfully implemented as proposed, including an assessment of the likelihood of their completion with the proposed cost and schedule.
- Proposer's task is to demonstrate that the investigation implementation risk is LOW. TMC panel's task is to try to validate proposer's assertion of LOW risk.
- Risk is to be assessed on the basis of the material in the proposal and the clarification process.
- The Cost Analysis is integrated into the overall Risk Rating.
- Proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the proposer.



# TMC Evaluation Criterion C Factors

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## Criterion C: TMC Feasibility of the Proposed Mission Implementation

- Factors from IMAP AO Section 7.2.4
  - Factor C-1. Adequacy and robustness of the instrument implementation plan.
  - Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.
  - Factor C-3. Adequacy and robustness of the flight systems.
  - Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.
  - Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.



# TMC Panel Product: Form C

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For each proposal, the TMC Evaluation will result in a Form C that contains:

- Proposal title, PI name, and submitting organization;
- Based on findings, an adjectival median risk rating of “LOW Risk”, “MEDIUM Risk”, or “HIGH Risk” for TMC Feasibility of the Proposed Mission Implementation;
- Polling distribution for the median risk rating\*;
- Summary rationale for the median risk rating;
- Narrative findings, identified as major or minor strengths or weaknesses;
- Comments to the PI, comments to NASA\*, and comments to the Science Panels\*. (optional)

\* Note: not provided to proposers



# TMC Evaluation Products: Findings

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Major and minor strengths and weaknesses are defined as follows:

- **Major Strength:** A facet of the implementation response that is judged to be well above expectations and can substantially contribute to the ability of the project to meet its technical requirements on schedule and within cost.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its technical objectives on schedule and within cost.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is not a discriminator in the assessment of risk.

Note: Findings that are considered “as expected” are not documented in the Form C.



# TMC Cost Analysis

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- Because the IMAP selection may be made with a single step, the TMC cost analysis will include a cost risk rating.
- Initial cost analyses is accomplished on the basis of information provided in the proposals (consistency, completeness, proposed basis of estimate, contributions, use of full cost accounting, maintenance of reserve levels, cost management, etc.).
- Two or more cost models are utilized to validate the proposed cost.
- Implementation threats are identified.
- Cost threat impacts to the proposed unencumbered reserves are assessed (see Cost Threat Matrix slide 11). The remaining unencumbered reserves are compared to the minimum required in the AO.
- The entire panel participates in Cost deliberations. All information from the entire evaluation process is considered in the final cost assessment.
- Cost Risk is reported as an adjectival rating, ranging from “LOW Risk” to “HIGH Risk” on a five-point scale.
- Significant findings are documented in the Cost Factor on Form C and considered in the TMC Risk Rating.



# Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as “This finding represents a cost threat assessed to have a Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Very Minimal/Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations.”
- The *likelihood* is the probability range that the *cost impact* will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The cost threat matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.
- The *minimum* cost threat threshold is \$1M.

		Cost Impact (CI) % of PI-Managed Mission Cost to complete Phases A/B/C/D or % of Phase E not including unencumbered cost reserves or contributions						
Likelihood of Occurrence		Weakness	Very Minimal 1% < CI ≤ 2.5% (\$0M < CI ≤ \$0M) 1% < CI ≤ 2.5% (\$0M < CI ≤ \$0M)	Minimal 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M) 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M)	Limited 5% < CI ≤ 10% (\$0M < CI ≤ \$0M) 5% < CI ≤ 10% (\$0M < CI ≤ \$0M)	Moderate 10% < CI ≤ 15% (\$0M < CI ≤ \$0M) 10% < CI ≤ 15% (\$0M < CI ≤ \$0M)	Significant 15% < CI ≤ 20% (\$0M < CI ≤ \$0M) 15% < CI ≤ 20% (\$0M < CI ≤ \$0M)	Very Significant CI > 20% (CI > \$0M) CI > 20% (CI > \$0M)
Likelihood (L, %)	Almost Certain (L > 80%)							
	Very Likely (60% < L ≤ 80%)							
	Likely (40% < L ≤ 60%)							
	Possible (20% < L ≤ 40%)							
	Unlikely (L ≤ 20%)							

Note: Each instance of “\$0M” in the table above is converted to dollars according to the associated percentage, on a proposal-by-proposal basis. Depending on proposed PI-Managed Mission Cost, some columns may not apply.



# Clarifications

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NASA will request clarification of potential major weaknesses (PMWs) identified during the evaluations of “Scientific Merit of the Proposed Investigation,” “Scientific Implementation Merit and Feasibility of the Proposed Investigation” and “TMC Feasibility of the Proposed Mission Implementation” evaluation panels.

- NASA will request such clarification uniformly, from all proposers.
- All requests for clarification from NASA, and the proposer’s response, will be in writing.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers.
- PIs whose proposals have no PMWs will receive an email informing them.
- The form of the clarifications is strictly limited to a few types of responses:
  - Identification of the locations in the proposal (page(s), section(s), line(s)) where the PMW is addressed.
  - Acknowledge that the PMW is not addressed in the proposal.
  - Stating that the PMW is invalidated by information that is common knowledge and is therefore not included in the proposal.
  - Stating that the analysis leading to the PMW is incorrect and identifying a place in the proposal where data supporting a correct analysis can be found.
  - Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside or outside of the proposal.
- The PI will be given at least 24 hours to respond to the request for clarification. Any response that does not correspond to any of the options above, or does not conform to guidelines provided with the request, will be redacted or deleted, and will not be shown to the evaluation panel.



# Cost Risk Definitions

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The three elements below are indicators of Cost Risk. Evaluators must consider these elements and other relevant information (e.g., cost model applicability, uncertainty of the cost models error bars, effect of cost issues that fall below the minimum cost threat threshold, likelihood of cost impacts, mitigating factors such as major strengths, etc.) together with their judgement in determining the appropriate Cost Risk for a particular investigation.

Three elements are considered for the determination of the Cost Risk for a proposed investigation; 1) The level of unencumbered reserves after any reduction by TMC identified cost threats; 2) The comparison of proposed cost with the TMC Base Independent Cost Estimate considering the appropriate error bars; and 3) The proposed cost, including reserves, supported by material in the proposal.

Appropriate Cost Reserves is defined as the minimum unencumbered reserves required by the Announcement of Opportunity (AO), or higher as judged by the TMC evaluation panel based on the justification provided by the PI (Principal Investigator). Unencumbered cost reserves higher than the minimum AO requirement may be necessary for some investigations, such as those requiring specific technology maturation.



# Cost Risk Definitions

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## Low Risk

- No cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of all modelled lower Work Breakdown Structure (WBS) levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is very well supported by the information in the proposal.

## Low/Medium Risk

- No cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of most modelled lower WBS levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is well supported by the information in the proposal.

## Medium Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost or the cost of most modelled lower WBS levels are greater than or equal to the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is mostly supported by the information in the proposal.



# Cost Risk Definitions

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## Medium/High Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves below the Appropriate Cost Reserves.
- The proposed investigation cost or the cost of most modelled lower WBS levels are lower than the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is not well supported by the information in the proposal.

## High Risk

- Cost threats have been identified by the TMC evaluation panel that reduce the proposed unencumbered cost reserves significantly below the Appropriate Cost Reserves.
- The proposed investigation cost and the cost of most modelled lower WBS levels are significantly lower than the lower bounds of the TMC Base Independent Cost Estimate error bars.
- The proposed investigation cost estimate is not supported by the information in the proposal.



# TMC Evaluation Products: Risk Ratings

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Based on the narrative findings, each proposal will be assigned one of three risk ratings, defined as follows:

- **LOW Risk:** There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within available resources.
- **MEDIUM Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Investigation design may be complex and resources tight.
- **HIGH Risk:** One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.

Note: Only Major findings are considered in the risk rating.



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# IMAP AO Highlights



# IMAP AO

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- The IMAP AO is based on the latest Standard AO Template version.
- The main IMAP AO section has 107 requirements.
- Appendix B has 77 requirements.
- A subset of TMC related requirements are highlighted in following slides. (Topics listed include: selected topics that sometimes change across AOs, selected topics relatively new to the Standard AO, selected problem area topics for proposers)



# IMAP AO

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## Section 5.2 Technical Requirements

- Section 5.2.1, Complete Spaceflight Missions: “Each proposal shall fully describe the requirements for calibration and validation. ...” (Req 29)
- Section 5.2.7, Orbital Debris Assessment and End-of-Mission Spacecraft Disposal Requirement : “... proposals shall demonstrate satisfaction of requirements to limit the generation of orbital debris during mission operations and the disposal per NPR 8715.6B and NASA-STD-8719.14A (see Appendix B, Section J.8, for additional detail).” (Req 42)
- Section 5.2.8, Mission Category and Payload Risk Classification: “... proposers shall propose a risk classification (either Class B or Class C, with or without tailoring) for their proposed Category 2 mission. Proposers shall justify their choice of payload risk classification (with or without tailoring) and incorporate appropriate work effort and support in their proposals accordingly.” (Req 43)
- Section 5.2.10, Mission Operations Tools and Services: “If a ground/operations system solution other than the AMMOS or mission-unique adaptations to the AMMOS is proposed, it shall be described and budgeted for in the proposal.” (Req 45)



# IMAP AO

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## Section 5.2 Technical Requirements

- Section 5.2.3, New Technologies/Advanced Engineering Developments: “Pertaining to the baseline mission, this AO solicits flight missions, not technology or advanced engineering development projects. Investigations are generally expected to have mature technologies, **with systems at a Technology Readiness Level (TRL) of 6 or higher when proposed.** For the purpose of TRL assessment, **systems are defined as level 3 WBS payload developments (i.e., individual instruments) and level 3 WBS spacecraft elements (e.g., electrical power system);** see Figure 3-7 of the *NASA WBS Handbook*, NASA/SP-2010-3404, which can be found in the Program Library. TRLs are defined in NPR 7123.1B *NASA Systems Engineering Processes and Requirements*, Appendix E, which can be found in the Program Library as well.”

Also from this section: “Proposals that use systems currently at less than TRL 6 shall include a plan for system maturation to TRL 6 by no later than PDR and a backup plan in the event that the proposed systems cannot be matured as planned (see Appendix B, Section F, for additional detail). TDOs (see Section 5.9.5) are exempt from the requirement to mature systems to TRL 6 by PDR.” (Req 33)



# IMAP AO

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## Section 5.3 Management Requirements

- Section 5.3.1 Principal Investigator: “Designation of a deputy PI is recommended, but not required.”
- Section 5.3.3 Project System Engineer: “A proposal shall identify and designate, one and only one, PSE ...” (Req 48)
- Section 5.3.6 Risk Management: “If the proposed risk management approach includes potential de-scoping of mission capabilities, the proposal shall include a discussion of ... scientific impact of individual, as well as combined, de-scopes.” (Req 54)

## Section 5.4 Science Team, Co-Is, and Collaborators

- Section 5.4.3, Collaborators:
  - “Proposals shall identify and designate all collaborators, and describe the role of each collaborator in the development of the mission.” (Req 60)
  - “Proposals shall identify the funding source for each collaborator; the costs shall be included in the Total Mission Cost.” (Req 61)



# IMAP AO

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## Section 5.1 Science Requirements

- Section 5.1.6, Science Enhancement Option: “If SEO activities are proposed, the proposal shall define and describe the proposed activities and their costs.” (Req 21)

## Section 5.5 Small Business Participation and Education Program Plan

- Section 5.5.3, Student Collaboration :
  - “The proposal shall include a student collaboration and demonstrate that the proposed SC is clearly separable from the proposed Baseline and Threshold Science Mission investigations ...” (Req 62)
  - “The proposal shall identify the funding set aside for the SC; this funding may be outside the PI-Managed Mission Cost up to the student collaboration incentive, and any SC costs beyond the student collaboration incentive shall be within the PI-Managed Mission Cost.” (Req 63)



# IMAP AO

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## Section 5.6 Cost Requirements

- Section 5.6.1, PI-Managed Mission Cost and Total Mission Cost
  - “The proposed costs shall comply with and specify the AO Cost Cap (\$492M FY17 dollars)”. (Req 65)
- Section 5.6.2, Cost of the Phase A Concept Study: “Proposals shall include the cost of the Phase A concept study; the cost shall be included within the PI-Managed Mission Cost, and shall not exceed \$2.5M in FY17 dollars.” (Req 67)
- Section 5.6.3, Cost Estimating Methodologies and Cost Reserve Management
  - “Proposals shall identify and justify the adequacy of the proposed cost reserves. Proposals shall include a minimum of 25% of unencumbered cost reserves against the cost to complete Phases A/B/C/D and shall demonstrate an approach to maintaining required unencumbered cost reserves through subsequent development phases.” (Req 71)
  - “Although minimum unencumbered cost reserves are not specified in this AO for Phases E or F, proposals shall establish, identify and justify adequate reserves for these phases of the mission.” (Req 72)



# IMAP AO

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## Section 5.8 Additional Proposal Requirements

- Section 5.8.2, Personal Letters of Commitment
  - "No Institutional Letters of Commitment are required for individuals in the Step-1 proposal, unless the individual's effort is contributed, the individual is part of the Proposal Team. The Proposal Team is defined to include, but not be limited to, all members of the Key Management Team, any Co-I who is not part of the Key Management Team, and any collaborator who is not part of the Key Management Team."
- Section 5.8.4, Classified Materials
  - "Proposals submitted in response to this AO, as well as the proposed investigations and all proposed technologies, shall be unclassified. The proposal shall be complete including an unclassified appendix regarding heritage." (Req 92)
  - "Proposers that choose to submit a classified appendix regarding heritage shall submit the appendix and a cover letter to NASA Headquarters no later than the deadline for receipt for the CD-ROM in Section 3. The proposer shall determine the appropriate security classification for the classified appendix, the proposer shall obtain any permission required for a reviewer to read the classified appendix, and the proposer shall ensure that all appropriate security requirements are followed in delivering the classified appendix to NASA Headquarters." (Req 93)



# IMAP AO

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## Section 5.9 Program Specific Requirements and Constraints

- Section 5.9.2, Schedule Requirements: “Proposals shall propose a launch readiness date no later than December 2024.” (Req 95)
- Section 5.9.3, Launch Services
  - “The IMAP investigation will be launched as the primary payload on a single expendable launch vehicle (ELV) that NASA will provide as Government Furnished Equipment (GFE).”
  - “If nonstandard services not specified in *ELV Launch Services Information Summary* are required, the proposal shall include the cost of such services in the PI-Managed Mission Cost.” (Req 97)
  - “Contributed launch services cannot be proposed or considered under this AO.”



# IMAP AO

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- Section 5.9.4, IMAP Active Link Incentive for Real-Time (I-ALIRT)
  - Proposals may define I-ALIRT activities; see Requirement 99 in IMAP AO Section 5.9.4.
  - NASA provides an I-ALIRT incentive of up to \$3.0M (FY17). Costs greater than incentive are part of PI-Managed Mission Cost.
  - Factor C will not consider I-ALIRT to be part of the Baseline Science Mission implementation. However, a separate evaluation of the feasibility of the proposed I-ALIRT implementation will be performed. (Section 7.2.4)
- Section 5.9.5, Technology Demonstration Opportunity
  - Proposals may define TDOs; see Requirements 100-102 in IMAP AO Section 5.9.5.
  - NASA provides an I-ALIRT incentive of up to \$5.0M (FY17). Costs greater than incentive are part of PI-Managed Mission Cost.
  - Factor C will not consider TDO to be part of the Baseline Science Mission implementation. However, a separate evaluation of the feasibility of the proposed TDO implementation will be performed. The TDO has to be shown to be clearly separable from the implementation of the Baseline and the Threshold Science Mission. (Section 7.2.4)



# IMAP AO

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- Appendix B, F.2 Mission Concept Descriptions –
  - Trajectory. “The following information shall be provided in a file or files on the CD-ROM containing the electronic version of the proposal. There is no requirement that this data also be included in the electronic proposal (uploaded PDF file). Any graphical references, tables, figures, etc. must be presented in a minimum of 150 dots per inch (dpi). ...” (Req B-34)
  - Flight System Capabilities: “This section shall address the following flight system capabilities to the extent that they are applicable to the proposed mission and that they are known at the time of proposal submission....(f) Flight software, including (i) an estimate of the number of logical lines of code by Computer Software Configuration Item (CSCI), (ii) description of the functionality for each CSCI, (iii) code counts categorized as either New, Modified, Full Reuse, or Auto-generated, (iv) development method (spiral, waterfall, agile, etc.), and (v) development language.” (Req B-35)
- Appendix B, F.3 Development Approach
  - Systems Engineering Development Approach (Req B-39)



# IMAP AO

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- Appendix B, F.4 New Technologies/Advanced Developments – Req B-40
  - “This section shall describe any proposed new technologies and/or advanced engineering developments and the approaches that will be taken to reduce associated risks. Descriptions shall address, at a minimum, the following topics:
    - Identification and justification of the TRL for each proposed system (level 3 WBS payload developments and level 3 WBS spacecraft elements) incorporating new technology and/or advanced engineering development at the time the proposal is submitted (for *TRL definitions*, see NPR 7123.1B, *NASA Systems Engineering Processes and Requirements*, Appendix E, in the Program Library);
    - **Rationale for combining the TRL values of components and subsystems to derive each full system TRL as proposed, appropriately considering TRL states of integration** (see NASA/SP-2007-6105 Rev 2, *NASA Systems Engineering Handbook*);
    - Rationale for the stated TRL value of an element that is an adaptation of an existing element of known TRL;
    - The approach for maturing each of the proposed systems to a minimum of TRL 6 by PDR:
      - Demonstration (testing) in a relevant environment can be accomplished at the system level or at lower level(s);



# IMAP AO

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- Appendix B, F.4 New Technologies/Advanced Developments – Req B-40 (cont'd)
  - If applicable, **justify what demonstration(s) in a relevant environment** at lower level(s) (subsystem and/or subsystem-to-subsystem) **would be sufficient to meet system level TRL 6**, considering (i) where any new technology is to be inserted, (ii) the magnitude of engineering development to integrate elements, (iii) any inherent interdependencies between elements (*e.g.*, critical alignments), and/or (iv) the complexity of interfaces – **see the Program Library for examples**;
  - Include discussion of simulations, prototyping, demonstration in a relevant environment, life testing, etc., as appropriate;
  - An estimate of the resources (staffing, cost, and schedule) required to complete the technology and/or advanced engineering development; and
  - Approaches to fallbacks/alternatives that exist and are planned, a description of the cost, decision date(s) for fallbacks/alternatives, relevant development schedules, and performance liens they impose on the baseline design, and the decision milestones for their implementation.

If no new technologies or advanced engineering development is required, system TRL 6 or above at the time of proposal submission shall be clearly demonstrated.”



# IMAP AO

- Appendix B, F.6 Schedule – Req B-43
  - “A project schedule foldout(s) covering all phases of the investigation shall be provided to at least WBS level 3, except where greater detail is necessary to identify critical paths, as well as significant TRL or engineering development activities and events. The first 3 foldouts will not be counted against the page limits. The schedule format shall indicate the month and year of each milestone, have a corresponding table of dates, and follow standard NASA WBS elements for task descriptions as prescribed in NPR 7120.5E. The schedule foldout(s) and accompanying narrative (included in the page count for this section) shall address proposed major milestones including, at a minimum, the following items: ...”
- Appendix B, F.6 Schedule – Req B-44
  - “The project schedule shall be additionally provided in Microsoft Project format on each CD-ROM submitted. Although the project schedule foldout(s) in Requirement B-43 does not need to have been generated in Microsoft Project, the project schedule provided on each CD-ROM shall address the items specified in Requirement B-43 **at a level of detail commensurate with that of the graphical foldout.** The Microsoft Project schedule **is not intended to be a fully Integrated Master Schedule** for the project, but rather, it is to be a representation of the summarized schedule foldout that provides a quantified data set that will facilitate understanding of the proposed flow of development activities, timelines, milestones, schedule reserves, and risk. Although tasks in this high-level summary schedule are not expected to be fully linked to their predecessor and successor tasks, **the level of linkage detail should support the assignment of the critical path in the graphical foldout.** Task links are also needed to identify points of assembly, integration, and testing in the schedule and links to major milestones.”



# IMAP AO

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- Appendix B, G. Management – Req B-46
  - “This section shall describe the specific roles and responsibilities of the PI, PM, PSE, and other named Key Management Team members. ... The time commitment of each Key Management Team member shall be provided by mission phase. ...”
- Appendix B, H. Cost – Req B-51
  - Provides more detail on the BOE supporting data to be provided.
- Appendix B, J. Proposal Appendices – Req B-57
  - “... The proposer shall *not* include in these Appendices material required in the page-limited sections in the body of the proposal. ...”
- Appendix B., J.11. MEL – Req B-74
  - Describes additional detail to be provided for electronic boards.
- Appendix B., J.12. Heritage –
  - The Heritage Appendix is limited to 30 pages.
  - “If a proposal claims any heritage from which the proposed investigation derives substantial benefit, this appendix shall discuss each element to an appropriate level of granularity (*e.g.*, component, assembly, subsystem) to clearly separate the heritage element from other elements of the design.” (Req B-76)



# References

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- IMAP Acquisition Homepage
  - <https://soma.larc.nasa.gov/STP/IMAP>
- Contents of the web site include links to the following:
  - Community Announcements
  - NSPIRES for access to the solicitation
  - Program Library
  - Q&A
  - Evaluation Plan
  - Pre-proposal Conference presentations
- The Program Library provides additional regulations, policies, and background information.
  - <https://soma.larc.nasa.gov/STP/IMAP/imap-program-library.html>
  - A change log is included



# Questions

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All questions pertaining to the IMAP AO proposals must be addressed to:

Dr. Arik Posner  
IMAP Program Scientist

By email at:

arik.posner@nasa.gov  
subject line to read "IMAP AO"

Or by mail at:

Science Mission Directorate  
NASA Headquarters  
300 E Street SW  
Washington, DC 20546-0001



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# Supplemental



# TRL Issues

## Issues that often contribute to TRL weaknesses:

- TRL Assessment
  - No TRL assessment is given to the system level (only at lower levels)
  - Inadequate discussion on combining subsystem TRL to derive the full system TRL
  - Inadequate discussion on combining component TRL to derive the subsystem TRL
  - TRL claims are not substantiated or are overstated
    - TRL claim is based on heritage for a different application or environment
    - TRL claim is based on heritage for a design that is proposed to undergo modifications
    - TRL is overstated and therefore, there is no plan to demonstrate TRL 6 by PDR
- Development Plan
  - Inadequate discussion on raising (build and test) the system to TRL 6
  - The development required is inadequately described
  - Inadequate testing, e.g.,
    - Testing is not described
    - Planned testing is insufficient
    - Test results are not compared to analytical predictions
    - Testing in a relevant environment is not shown
    - System is not tested in a relevant environment, nor is a justification provided that demonstrations in a relevant environment at lower level(s) would be sufficient to meet system level TRL 6
  - Planned testing is too optimistic and success oriented for low TRL hardware to achieve TRL 6 by PDR. There is no schedule margin for potential testing setbacks.
  - Inadequate or no backup plan for subsystems and components that are not at TRL 6